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SALT-BONEMEAL MIXTURE USED BY BREEDING COWS ON SHORT-GRASS RANGES DURING FOUR SUMMER AND THREE WINTER SEASONS

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Salt, like grass and water, is essential in range livestock operations. The value of salt as a body builder, as well as an aid to uniform forage utilization and better distribution of animals on the range, has long been recognized by progressive stockmen. A systematic program of salting has been helpful in getting better use of forage on national forest as well as other ranges. The use of salt mixed with bonemeal is becoming a common practice on some ranges which are deficient in phosphorus. Any range practice that offers promise of more efficient forage use or greater production of meat with a minimum of extra labor is of particular significance under wartime conditions.

The amount of salt which range cattle will voluntarily use varies by seasons and from one range to another, depending upon the weather, the composition and condition of the forage, the amount of alkali in the soil, the quality of available water and the class of cattle. During a 3-year drought period, range cows with calves used 0.93 pound of salt per cow-month on the average on the Jornada Experimental Range in southern New Mexico (1).1/ Big steers used 2.5 and 2.1 pounds per head per month from May to September in 1936 and 1938, respectively, on cut-over pine ranges in California (4). A group of mixed cattle, which included some yearlings, used only 1.5 pounds per head per month on the same range during a similar period in 1937.

During the summer seasons of 1925, 1926 and 1927, which were dry, average and wet, respectively, cows with calves used an average of 0.6 pound of salt per cow-month in the Poker Jim pasture of the Custer National Forest in southeastern Montana (3), where there was considerable alkali in the soil and in stock water.

Salt-bonemeal Used Four Summers, 1940 to 1943, Inclusive

During the past four seasons, a record was made of the amount of salt-bonemeal mixture used by three groups of well bred Hereford range cows and their spring calves on experimental short-grass pastures grazed during a 6-month summer period under heavy, moderate and light degrees of stocking or intensities

1/ Numbers in parentheses refer to literature cited.

near Miles City, Montana.[2/] The mixture consisted of one part steamed bonemeal and three parts crushed rock salt. A supply of this mixture was available at all times to each pasture group of 10 cows and their calves. Two such groups or a total of 20 cows were grazed at each of the three intensities.

A central well supplied all pastures with stock water, but surface water was occasionally available after rains. Both the surface water and water from the well contained considerable alkali and doubtless provided some part of the minerals needed.

Each salt trough was located about midway between the central well and the farthest extremity of the pastures, usually 3/8 to 1/2 mile from permanent water. Salting away from the well reduced the concentration at that central point and helped to get uniform grazing use over the experimental pastures. The salt troughs were emptied and refilled periodically and weights were recorded of the unused mixture as well as any new amount added. The amount of the mixture lost through weathering, which was not separately determined, was assumed to be uniform for all pastures. The following table summarizes the amount of the mixture used during the four summer seasons.

Table 1.--Average amount of salt-bonemeal mixture used in ounces per cow-day and in pounds per cow-month and per summer season by cows with calves in pastures grazed at three intensities during four summer seasons, 1940 to 1943, inclusive.

1940-1941

Period	1940 Grazing Season			1941 Grazing Season			ALL LOTS	
	Lot 1°	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	1940	1941
	(Ounces used per cow-day)							
May 16-June 12	0.32	0.40	0.39	0.41	0.41	0.39	0.37	0.40
June 13-July 12	0.12	0.26	0.23	0.16	0.16	0.14	0.20	0.15
July 13-Aug. 21	0.16	0.36	0.19	0.37	0.45	0.33	0.24	0.38
Aug. 22-Oct. 8	0.34	0.48	0.27	0.33	0.45	0.55	0.36	0.44
Oct. 9-Oct. 30	1.02	1.44	0.94	0.64	0.50	0.41	1.13	0.52
Oct. 31-Nov. 14	0.24	0.13	0.46	0.20	0.19	0.21	0.28	0.20
Average mixture used in pounds per cow, approximately 6 mos.	3.83	6.06	4.54	4.11	4.36	4.11	4.81	4.19
Average pounds per cow per month (during approximately 6 mos.)	0.64	1.01	0.76	0.68	0.73	0.68	0.80	0.70

°/ Lot 1, on heavily grazed pastures.
Lot 2, on moderately grazed pastures.
Lot 3, on lightly grazed pastures

2/ These data are from a range experiment conducted since 1932 by the U.S. Forest Service at the U.S. Range Livestock Experiment Station near Miles City, Montana, in cooperation with the U.S. Bureau of Animal Industry and the Montana Agricultural Experiment Station.

Table 1 continued

1942-1943

Period	1942 Grazing Season			1943 Grazing Season			ALL LOTS	
	Lot 1°/	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	1942	1943
	(Ounces used per cow-day)							
May 14-June 25	0.40	0.40	0.34	0.26	0.37	0.37	0.38	0.34
June 26-July 23	0.22	0.30	0.34	0.54	0.53	0.48	0.28	0.53
July 24-Sept. 17	0.21	0.23	0.23	0.50	0.51	0.62	0.22	0.54
Sept. 18-Oct. 29	1.15	1.24	1.11	0.96	1.15	0.96	1.17	1.02
Oct. 30-Nov. 12	1.26	1.26	1.26	1.06	1.06	1.06	1.26	1.06
Average mixture used in pounds per cow, approximately 6 mos.	6.50	7.00	6.55	6.90	7.64	7.46	6.68	7.33
Average pounds per cow per month (during approximately 6 mos.)	1.07	1.15	1.07	1.14	1.26	1.23	1.12	1.21

°/ Lot 1, on heavily grazed pastures.
Lot 2, on moderately grazed pastures.
Lot 3, on lightly grazed pastures.

During the last three years, a somewhat smaller amount of the mixture was used in winter than in summer. For the 6-month winter seasons during which cows subsisted on range forage except for short periods when some hay was fed to a few thin ones, salt-bonemeal use ranged from 0.28 to 1.06 pounds and averaged 0.63 pound per cow per month. The smallest amount was used during the winter of 1940-41 and the largest amount in 1942-43. This amount, when added to the mixture taken during the 6-month summer season, rounds out the record for salt-bonemeal used by breeding cows on this yearlong short-grass range. During the 3-year period, the first three summer seasons plus the intervening winter periods, salt-bonemeal use ranged from 0.55 pound per cow-month in 1940 to 1.05 pounds per cow-month during the 1942 grazing year and averaged 0.74 pound per cow-month per year. This rate equals approximately 9 pounds per cow on yearlong range.

Use Varied with Weather Conditions

Each of the last four summer grazing seasons was about normal or above from the standpoint of precipitation and the forage crop produced. The 1940 season got off to a good start but warm and somewhat drier conditions prevailed through July and August and caused the forage to become dry and mature. Fall rains revived some species, which produced considerable green feed in late September and throughout October, and brought the total precipitation for the growing season, April through September, to 9.27 inches. In 1941 the season was a little drier to start, but beginning in late May abundant, well distributed precipitation provided green grass throughout the season. The total precipitation for the 6-month growing season in 1941 was 14.75 inches. In 1942 precipitation was above average and well distributed throughout the growing period and totalled 11.4 inches for six months. The biggest forage crop since the drought

was produced in 1942 as a result of favorable current weather plus an accumulated moisture reserve carried over from the previous year. The early part of the 1943 summer season was cold and dry and the forage crop was considerably delayed. Unusually heavy precipitation occurred in June and above average rainfall was recorded again in August. The total for the 6-month growing season was 11.7 inches, but it was poorly distributed. Forage was abundant in 1943 in spite of the poor distribution of rainfall. Grama grass grew higher than in any year since the drought.

The use of salt-bonemeal mixture dropped sharply, every year and for all intensities, in late June and early July from the higher May-early June level, then increased through August and reached a peak in October. After late October in 1940 and 1941, when calves were weaned and the supply of forage was quite limited, salt-bonemeal use decreased almost to the June-early July low level. During the other two seasons a slight decrease came after late October, but the rate of use remained high throughout the last two weeks of the grazing season.

The amount of salt-bonemeal mixture used ranged from 0.6 to 1.26 pounds per cow-month and averaged about 0.96 pound for three groups of 20 breeding cows and their calves through four summer seasons of about six months each. The differences between lots in any year were generally small and there was no consistent relation between salt-bonemeal use and grazing intensity. There was, however, a considerable difference between the amount used during the first two summer seasons and the last two. In 1940 and 1941, the amount of salt-bonemeal used ranged from 0.6 to 1.0 pound and averaged 0.75 pound per cow-month. In 1942 and 1943 the range was from 1.07 to 1.26 pounds and the average amount used was 1.12 pounds per cow-month. This difference may be the result of many factors, but the unusually large forage crops of the last two seasons are believed to be largely responsible. Most range plants grew to greater heights in 1942 than in any year since 1933. Again in 1943, most species grew rank and coarse and the opinion that the grass lacked "strength" and quality was often heard. This opinion is supported by the fact that calves from these experimental cows weaned lighter both in 1942 and 1943 than in 1941, and the cows entered the winters at lighter weights than in 1941. More supplemental feed was required during the winter of 1942-43 and the cows were lighter in the spring than a year earlier. The amount of salt-bonemeal mixture used during a 6-month season that winter averaged 0.99 pound per cow-month compared to 0.56 and 0.35 pound per cow-month during the two preceding winters.

The relatively higher use of the mixture in late September and October during all summer seasons may also have been the result of several factors. After four months of grazing, mature forage was less abundant and its mineral content probably lower than it was earlier. Some green fall regrowth was available during this period each season, except in 1943, but it seems that this limited source of minerals was not sufficient to meet the needs of the cows and growing calves. Also, the calves were observed eating some of the mixture during the fall months before they were weaned, but they used very little, if any, of it through the earlier part of the season.

It is of interest to note that these cows used more than half the yearlong total of the salt-bonemeal mixture during the six summer months. This indicates that the practice of some operators of providing salt during winter months only, deprives cows of minerals needed during the summer months and may correspondingly reduce their welfare. At any rate, it points rather clearly to the desirability of providing salt for cattle on such range throughout the year.

Kennedy (2) has reported that breeding cows with calves used between 0.7 and 0.8 pound of salt-bonemeal mixture, while grazing these same pastures during the summer of 1933. Precipitation during the 1933 growing season amounted to only 6.46 inches, 2.8 inches below normal, but the forage grew until late June and enough was produced to carry the cows on summer range until November 15 without supplemental hay. During the 1934 summer season, which was the driest on record, these same cows used $1\frac{1}{2}$ to $3\frac{1}{2}$ pounds of the mixture per cow-month or 2 to 4 times more than they did in 1933. Only 3.53 inches of precipitation occurred during the 1934 growing season and until supplemental hay feeding was begun sagebrush and old ungrazed forage produced the previous year provided practically the only feed available. Kennedy concluded from this that breeding cows on shortgrass range may require more salt during drought than during more nearly normal seasons when range forage contains greater quantities of minerals.

It seems now, based on the additional data, that range cows may also use more salt-bonemeal in an unusually favorable season than during more normal summers. Reduced cattle weights and the large amount of the mineral mixture used after September 15 the last two years indicate that the forage may have been low in some constituents during 1942 and 1943. The occurrence of a condition, which was tentatively diagnosed as a nutrient or mineral deficiency in three of the experimental cows provides some further evidence that the abundant forage in 1942 and 1943 might have lacked "strength." One of these cows died late in 1942 due to this condition and recent analyses of blood from the two remaining ones indicate a definite phosphorus deficiency. This strongly suggests that native short-grass forage may contain a reduced percentage of certain minerals or nutrients during an unusually favorable season, as well as during a drought when growth is much reduced.

Summary and Conclusions

During the last four summer grazing seasons, which were normal or above, range cows with calves used more salt-bonemeal mixture in the fall than in early or midsummer on short-grass ranges. The smallest amount was used in midsummer when calves were small and forage was maturing. A decrease in the amount used was noticeable after the calves were weaned. The average amount used was about 0.96 pound per cow-month for the four 6-month seasons. In the summer seasons of 1940 and 1941, an average of 0.75 pound of the mixture was used per cow-month, but during the last two summer seasons, when forage was rank and coarse, 1.12 pounds per cow-month were used. A smaller amount of the mixture was taken in winter and the average amount of the mixture used yearlong was about 0.74 pound per cow-month or a total of approximately 9 pounds per cow-year.

An earlier report shows that similar cattle used 0.7 to 0.8 pound of salt-bonemeal mixture per cow-month in these same pastures during the relatively normal summer season of 1933. During the extremely drought season of 1934, these cows used 2 to 4 times more of the mixture than in 1933.

It is concluded, therefore, that the amount of salt-bonemeal mixture which breeding cows with calves will use on such range in the Northern Great Plains varies widely, depending on seasonal conditions. About 3/4 to 1.0 pound per cow-month of such a mixture appears to be the minimum which should be allowed during summer in the best interest of good range and cattle

management. During drought seasons or when unusually favorable conditions permit abundant, coarse forage, this amount may need to be increased considerably. Somewhat less may be required during winter, but 3/4 pound per cow-month seems to be a suitable yearlong average. On other ranges, where there is less natural alkali in the soil and stock water, it has been reported that somewhat more than these amounts will be used even during normal seasons.

The present need for sustained maximum production of livestock and the prevailing favorable prices provide an unusual inducement to use ample salt or salt mixed with bonemeal, where the latter is needed, to aid good range and cattle management. The slight expense and labor involved in providing ample salt on cattle range, well located to encourage uniform use of the forage, will often yield greater benefits than most any other equal effort. Because of the present demand for maximum production, with limited labor, good salting practice becomes an item of high importance in range management.

LITERATURE CITED

(1) Ares, Fred N. How the use of salt obtains better forage utilization on a cattle range. The Cattleman, May 1936.

(2) Kennedy, Fred H. Range cattle in eastern Montana consumed abnormal amounts of salt during the 1934 drought. American Hereford Journal, December 15, 1935.

(3) Lommasson, Tom The value of salt on alkali ranges in southeastern Montana. (Unpublished address of Northwest Scientific Association, December 27-28, 1929, Spokane, Washington.)

(4) 1940 Annual Report. (Unpublished) California Forest and Range Experiment Station, Berkeley, California.